



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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GROUP 3600

In re Reissue Application of

JOHANSSON et al. Atty. Ref.: 1585-280; Confirmation No. 5947

Appl. No. 09/659,377 TC/A.U. 3641

Filed: September 7, 2000 Examiner: Behrend

(Merged with Reexamination
Control No. 90/005,098, filed
September 8, 1998)

MAIL STOP AF

For: OPTIMIZED CRITICAL POWER IN A FUEL BUNDLE WITH PART LENGTH
RODS

* * * * *

July 6, 2004

Mail Stop AF
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

AMENDMENT AFTER FINAL REJECTION

Responsive to the Official Action dated March 3, 2004, (for which petition is
hereby made for a one month extension of time), please amend the above-identified
application as follows:

07/08/2004 RHEBRAIT 00000068 09659377

01 FC:1251

110.00 OP

859803

AMENDMENTS TO THE SPECIFICATION:

Column 10, line 65, please amend the paragraph as follows:

The reader will realize that in this latter design, decreasing spacer pitch occurs at that portion of the fuel bundle wherein the void fraction increases. ~~In the above described embodiments, a single length for the partial length rods P has been specified for each bundle. Alternatively, all of the partial length rods within a bundle may have different lengths. See, for example the representative various lengths of the partial length rods in FIGS. 3B-3F.~~

AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions, and listings, of claims in the application:

1-14. (Cancelled).

15. (Currently Amended) In a boiling water reactor having discrete bundles of fuel rods confined within channel enclosed fuel assemblies wherein said fuel bundle includes:

a plurality of fuel rods for placement within said channel, each said fuel rod containing fissile material for producing a nuclear reaction when in the presence of sufficient moderating water coolant and moderated neutrons;

a lower tie plate for supporting said bundle of fuel rods within said channel, said lower tie plate joining the bottom of said channel to close the bottom end of said channel, said lower tie plate providing defined apertures for the inflow of water coolant in said channel between said fuel rods for generation of steam during said nuclear reaction;

said plurality of fuel rods extending from said lower tie plate wherein a single phase region of said water in said bundle is defined to an upward portion of said bundle wherein [[a]] an upper annular flow regime of said water and steam in said bundle is defined during said nuclear steam generating reaction in said fuel bundle;

an upper tie plate for supporting the upper end of said bundle of fuel rods, said upper tie plate joining the top of said channel, said upper tie plate providing apertures for the outflow of water and generated steam in said channel during said nuclear reaction;

spacers, each comprising a plurality of ferrules defining a matrix of individual fuel rod cells, located intermediate said upper and lower tie plates at preselected elevations along said fuel rods for maintaining said fuel rods in spaced apart location along the length of said fuel assembly including a first group of spacers in said ~~lower single phase~~ region of said fuel bundle and a second group of spacers in said upper annular flow regime of said fuel bundle, said ferrules each having a defined length dimension;

a portion of said plurality of said fuel rods being part length fuel rods extending from said lower tie plate towards said upper tie plate, said partial part length fuel rods terminating at ends within the said upper region annular flow regime of said fuel bundle before reaching said upper tie plate and causing decreased decreased pressure drop in said upper annular flow regime of said fuel bundle during said nuclear steam generating reaction;

the improvement to said bundle comprising:

means associated with a plurality of twisted tabs located in interstitial volumes within said length dimension of said ferrules and between said fuel rods in at least some of said second group of spacers containing part length fuel rods in the said upper annular flow regime of said fuel bundle for restoring at least some of the decreased pressure drop

realized by said part length fuel rods whereby improved critical power performance is achieved at said fuel bundle having said part length fuel rods.

16. (Previously Presented) The invention of claim 15 and wherein said means associated with at least some of said second group of spacers restores part but not all of said decreased pressure drop realized by said part length fuel rods.

17-34. (Cancelled).

35. (Currently Amended) In a boiling water reactor having discrete bundles of fuel rods confined within channel enclosed fuel assemblies, wherein said fuel bundle includes:

a fuel channel having vertically extending walls forming a continuous channel around a fuel assembly volume, said channel being open at the bottom end for engagement to a lower tie plate and open at the upper end for engagement to an upper tie plate;

a plurality of rods for placement within said channel, each said rod containing fissile material for producing a nuclear reaction when in the presence of water coolant;

a lower tie plate for supporting said bundle of rods within said channel, said lower tie plate joining the bottom of said channel to close the bottom end of said channel, said

lower tie plate providing defined apertures for the inflow of water in said channel between said rods for generation of steam during said nuclear reaction;

said plurality of fuel rods extending from said lower tie plate to an upward portion of said bundle wherein an upper annular flow regime of said water and steam in said bundle is defined during said nuclear steam-generating reaction in said fuel bundle;

an upper tie plate for supporting the upper end of said bundle of rods, said upper tie plate joining the top of said channel to close the top end of said channel, said upper tie plate providing apertures for the outflow of water and steam in said channel from a generation of steam during said nuclear reaction;

spacers, each defining a matrix of individual fuel rod cells, located intermediate said upper and lower tie plates at preselected elevations along said fuel rods for maintaining said fuel rods in spaced apart location along the length of said fuel assembly, said spacers including a first group of spacers in said a lower region of said fuel bundle and a second group of spacers in said upper annular flow regime of said fuel bundle;

a portion of said plurality of said fuel rods being part length fuel rods extending from said lower tie plate towards said upper tie plate, said partial part length rods terminating within the said upper annular flow regime of said fuel bundle before reaching said upper tie plate and causing decreased decreased pressure drop in said upper annular flow regime of said fuel bundle;

the improvement to said spacer distribution comprising:

a plurality of said second group of spacers in said upper annular flow regime of said fuel bundle supporting part length fuel rods including, at locations other than above said part length rods, having swirl vanes a plurality of twisted tabs attached to said plurality of said second group of spacers in interstitial volumes between said fuel rods to restore at least some of said decreased pressure drop in the said upper annular flow regime of the fuel bundle whereby the critical power of said fuel bundle is improved.

36. (Currently Amended) The invention of claim 35 and wherein said second group of spacers with said swirl vanes plurality of twisted tabs in the upper annular flow regime of said fuel bundle has the same pitch as said spacers without said swirl vanes.

37. (Cancelled).

38. (Original) The invention of claim 35 and wherein said matrix is a 10 by 10 matrix.

39. (Original) The invention of claim 35 and including up to twelve part length rods.

40. (Original) The invention of claim 38 and including up to twelve part length rods.

41. (Original) The invention of claim 35 and wherein said spacers include ferrule spacers.

42. (Currently Amended) The invention of claim 35 and wherein ~~the upper an~~
~~uppermost~~ spacer in said fuel bundle does not incorporate ~~swirl vanes~~ ~~twisted tabs~~.

43. (Currently Amended) The invention of claim 35 and where ~~the upper most an~~
~~uppermost~~ spacer in said bundle is an inconel spacer having low pressure drop and minimal pressure drop on the passing two phase flow in said upper two phase region of said fuel bundle.

44. (Original) The invention of claim 35 and including:
at least one large water rod extending in said fuel bundle having moderator contained therein for providing to said upper two-phase region of said fuel bundle additional moderator for moderating reaction produced fast neutrons to reaction continuing thermal neutrons, said large water rod occupying portion of the fuel rod positions in said fuel rod matrix.

45-108. (Cancelled).

109. (Currently Amended) The invention of claim 15 wherein said plurality of
twisted tabs means are provided in all of said second group of spacers with the exception
of an uppermost spacer in said upper annular flow regime of said fuel bundle.

REMARKS/ARGUMENTS

Reconsideration and withdrawal of all outstanding grounds of objection and/or rejection are respectfully requested in light of the above amendments and the remarks that follow.

At the outset, applicant refers to the Examiner's comments that this reissue application file does not contain an amendment filed April 8, 2002. The Examiner goes on to explain that the January 4, 2002 amendment (Paper No. 28) in the Reexamination No. 90/005,098 was not entered into the reexamination file as per the September 13, 2002 Decision vacating Final Office Action... (Paper No. 29).

While the amendment was not entered into the reexamination file, the fact remains that the preliminary amendment was submitted in this reissue application file, and there is no reason why that amendment should not have been entered. If by the statement "This reissue file does not contain an amendment filed April 8, 2002," the Examiner suggests that the amendment simply does not appear in the file, applicant submits herewith a postcard receipt indicating submission of the preliminary amendment and attaching a copy of that preliminary amendment. To the extent the Examiner's remark indicates that the preliminary amendment was not entered in the reissue application file, applicant in any event hereby incorporates in this response the amendments to claims 15 and 35 contained in that preliminary amendment.

The Examiner objects to the amendment filed May 27, 2003 under 35 U.S.C. 132 as containing new matter, specifically the text added to column 10, line 65 and following.

By this response, applicant has deleted the text objected to by the Examiner. Further in this regard, it is acknowledged that original dependent claim 30 has been cancelled by the Examiner per applicant's authorization.

The Examiner has rejected claims 15, 16, 20, 35-44, 107 and 109 under 35 U.S.C. 112, first paragraph, as containing subject matter not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that applicant had possession of the claimed invention when the application was filed. According to the Examiner, there is no support in the original disclosure for reciting that the means for restoring drop is positioned adjacent just one part length fuel rod.

Of the rejected claims, only 15, 16, 35, 36, 38-44 and 109 remain.

The language objected to by the Examiner contained in remaining independent claims 15 and 35 has been deleted from remaining independent claims 15 and 35. Claim 15 now requires a plurality of twisted tabs located in interstitial volumes...between said fuel rods in at least some of said second group of spacers containing part length rods...." Independent claim 35 has been similarly amended to require a plurality of twisted tabs attached to each of the plurality of the second group of spacers in interstitial volumes between the fuel rods. Support for these changes is found in the specification. See, for example, Col. 5, lines 2-4. It is respectfully submitted that, with these changes, the rejection as it applies to remaining claims has been overcome.

The Examiner has rejected claims 15, 16, 20, 35-44, 107 and 109 under 35 U.S.C. 251 as based upon new matter added to the patent for which reissue is sought. According

to the Examiner, the added matter includes the recitation that the means for restoring pressure drop is positioned adjacent just one part length fuel rod. For the same reasons presented above, this ground of rejection has been overcome by the amendments to remaining independent claims 15 and 35.

The Examiner has rejected claims 15, 16, 20, 35-44, 107 and 109 under 35 U.S.C. 251 as being broadened in a reissue application filed outside the two year statutory period. According to the Examiner, reciting that the means for restoring pressure drop is positioned adjacent just one part length fuel rod broadens the claims. This aspect of the rejection has been overcome by the amendments to remaining independent claims 15 and 35 discussed hereinabove.

The Examiner also contends that the limitation in independent claim 35 reciting that spacers from the second group of spacers can be at locations other than above the part length rod broadens the claims so that they now specifically include all locations, i.e., locations above the part length rods and locations other than above the part length rods. A similar ground of rejection is made in paragraph 8 of the Official Action, with the Examiner quoting different language from 35 U.S.C. 251, i.e., improperly broadened in a reissue application made and sworn to by the assignee and not the patentee.

Applicant refers to this additional rejection here because it includes further clarification of the Examiner's position with respect to the language that allegedly broadens the claim. Specifically, the Examiner contends that the language now specifically include all locations, not just locations above the part length rods.

Reconsideration of this ground of rejection are respectfully requested. Original patent claim 35 never required that the spacers in the second group of spacers just be at locations above the part length rods. Rather, original patent claim 35 required:

...a plurality of said second group of spacers in said upper annular flow regime of said fuel bundle having swirl vanes attached to said spacers to restore at least some of said decreased pressure drop....

In other words, original claim 35 simply required a plurality of the second group of spacers in the upper annular flow regime to have swirl vanes, without regard to location relative to the partial length fuel rods. Thus, the claim embraced an arrangement where plural spacers in the upper annular flow regime with swirl vanes would infringe the claim regardless of whether those spacers were located above and/or below the part length fuel rods. The amendment to claim 35 requiring that some of that plurality of second group of spacers be at locations other than above the part length rods clearly narrows the claim.

Now, in order to infringe claim 15, at least some of the second group of spacers in the upper annular flow regime must be located at locations other than above the part length fuel rods. This is a limitation which did not appear in the original claim. In other words, an arrangement of spacers in the upper annular flow regime with swirl vanes located only at locations above the part length rods (an arrangement that would have infringed original claim 35) would no longer infringe amended claim 35 because it does not also include other spacers at locations other than above the part length rods.

Accordingly, the ground of rejection set forth in paragraphs 7 and 8 as it applies to claims 35-44 has also been overcome.

The Examiner rejects claims 15, 16, 107 and 109 under 35 U.S.C. 102 as anticipated by Japan '986.

The Examiner points to vane 20 in Figure 6 of the '986 reference, and to the thicker grids in the part length fuel rod portions. Clearly, however, vane 20 is not attached to a spacer that contains part length fuel rods. Rather, the (apparently planar) vane 20 must be attached to a spacer located above the part length fuel rod 21 and is intended to project into the space corresponding to the upper part of the short fuel rods supported in the spacer below. Note also that fuel rod 2 is a full length fuel rod. Thus, the '986 patent neither discloses nor suggests the arrangement now required by independent claim 15 that there be a plurality of twisted tabs located in interstitial volumes between said fuel rods in at least some of said second group of spacers containing part length fuel rods in the upper annular flow regime.

Moreover, the Examiner's reference to the applicants' disclosure in column 5 of the '068 patent is not on point since, within the context of claim 15, thicker walls do not provide response for the plurality of twisted tabs.

The Examiner's comments regarding the position of projections 20 vis-à-vis the part length rod 21 are also inapt. The spacer from which the planar projection 20 depends is clearly located above the part length rod 21 contrary to the claimed requirement that the twisted tab be included in a spacer that contains a part length fuel rod in the upper annular flow regime. There is no indication in the '986 patent that any spacer containing a projection 20 is one that also supports part length fuel rods.

The Examiner's statements on page 7 regarding inherent function assumes identity of structure and in light of the above remarks, it is readily apparent that Japan '986 does not disclose structure that is identical to the structure required by independent claim 15 as amended herewith.

The Examiner's comments regarding an opposition proceeding in the European Patent Office is irrelevant here not only because such decisions are not controlling in the U.S. Patent and Trademark Office, but also because claim 15 in this reissue application is not identical to claims at issue in that proceeding.

Dependent claim 109 requires that the twisted tabs be provided in all of the second group of spacers with the exception of an uppermost spacer in the upper annular flow regime of the fuel bundle. This arrangement is nowhere disclosed or suggested in the '986 patent, and therefore claim 107 is patentable along with claim 15 from which it depends.

Accordingly, for the reasons presented above, the Section 102 anticipation rejection against remaining claims 15, 16 and 109 is improper and should now be withdrawn.

The Examiner has also rejected claims 15, 16, 20, 22-29, 31-44 and 107-109 under 35 U.S.C. 103 as unpatentable over Japan '986 in view of Leclercq.

Of the above claims, only claims 15, 16, 35, 36-44 and 109 remain for consideration under this ground of rejection.

With respect to independent claims 15 and 35, Leclercq does not remedy the deficiencies of the Japan '986 patent discussed above. Specifically, nowhere in Leclercq is there any suggestion of the utilization of twisted tabs in spacers containing part length rods in the upper annular flow regime. The flow tabs 40 in Leclercq that appear in the upper group of spacers 20 are clearly planar, not twisted. Moreover, Leclercq, as already pointed out in previous discussions, suggests nothing with respect to any structural arrangement that contains part length fuel rods since, in Leclercq, all of the fuel rods are full length rods. Thus, no combination of Japan '986 and Leclercq renders obvious the subject matter of independent claims 15 or 35 and claims that depend therefrom.

The Examiner's comments on page 10 that the use of vanes formed of twisted elements for imparting a swirl to the coolant are conventionally known...and their use is hence *prima facie* obvious, is clearly improper since applicant is not merely claiming the use of twisted elements. Rather, applicant is claiming the entirety of the structure required by claims 15 and 35, including fuel bundles with part length rods and including the specific arrangement required by the last paragraphs of those claims.

Further in this regard, the mere fact it was known in the art to use swirl vanes under certain circumstances does not provide sufficient evidence to reach a conclusion of *prima facie* obviousness with respect to the utilization of twisted tabs within the specific context of the spacer arrangement required by the claims of this application, and including the use of such twisted tabs within interstitial volumes of spacers located within the upper annular flow regime of a fuel bundle, and with those spacers also containing

part length fuel rods. Any rationale for concluding obviousness of this configuration is necessarily based upon the utilization of impermissible hindsight. Accordingly, the rejection under 35 U.S.C. 103 of claims 15, 16, 35, 36, 38-44 and 109 under Japan '986 in view of Leclercq should now also be withdrawn.

The Examiner has also rejected claims 15, 16, 20, 22-29, 31-44, 107 and 109 under 35 U.S.C. 103 as unpatentable over Japan '986 in view of Leclercq and further in view of Thomazet '516, Japan '690, Japan '592, Japan '493 or Japan '388. None of the additionally applied secondary references disclose the twisted tab arrangement as now required by independent claims 15 and 35. Rather, they appear to have been cited merely as indicating that it was known in the art to increase the pitch of spacers, to utilize simple planar flow tabs and/or spacers of greater height than conventionally used. None, considered alone or in combination with the '986 patent and Leclercq, suggest a plurality of twisted tabs in spacers supporting part length fuel rods in the upper annular flow regime of a fuel bundle.

Moreover, the Examiner's contention that these references are merely cited as teaching expedience for overcoming prior art problems, enhancing performance or usefulness of a fuel assembly by itself is insufficient to establish obviousness under 35 U.S.C. 103. It remains that the entirety of the inventions recited in independent claims 15 and 35 are nowhere disclosed or suggested by the applied prior art, and therefore this ground of rejection is also improper and should be withdrawn.

The Examiner has also rejected claims 15, 16, 20, 22-29, 31-44, 107-109 under 35 U.S.C. 103 as unpatentable over Japan '986 in view of Leclercq and further in view of Orii et al., Hatfield or Buettiker. Orii, Hatfield or Buettiker are merely cited as evidence of prior use of swirl vanes. They do not disclose or suggest the utilization of twisted tabs in the upper annular two phase region of a fuel bundle that incorporates part length rods alone or in combination with the Japan '986 and LeClercq references. Thus, the additional references add nothing to the combination not already addressed above. The rejection as it applies to remaining claims 15, 16, 31-36, 38-44 and 109 is improper and should be withdrawn.

The Examiner has also rejected claims 15, 16, 20, 22-29, 31-44, 107-109 under 35 U.S.C. 103 as unpatentable over Japan '986 in view of Leclercq and any of Thomazet, Japan '690, Japan '493, Japan '592 and further in view of any of Orii, Hatfield or Buettiker.

The rejection should also be withdrawn for all of the reasons presented above, especially when considered in light of the amendments to independent claims 15 and 35 discussed above.

The Examiner has rejected claims 15, 16, 22-29, 31-34 and 107-109 under 35 U.S.C. 103 as unpatentable over Japan '986 in view of Leclercq, Japan '690 or Japan '592. In light of the amendments to independent claims 15 and 35, and in view of the fact that the references do not suggest the claimed arrangement for the reasons presented above,

this ground of rejection must also be withdrawn. Moreover, the decreased pitch feature mentioned by the Examiner does not appear in claim 15.

The Examiner has also rejected claims 15, 16, 20, 35-44 and 107 under 35 U.S.C. 103 as unpatentable over Japan '986 in view of Japan '493 alone or in view of any of Orii, Hatfield or Buettiker. Here again, the references that have already been discussed above, fail to disclose or suggest the arrangement particularly as now required by independent claims 15 and 35 as amended. Please also note again that the use of planar flow tabs does not respond to the requirement in the independent claims for twisted tabs located within interstitial volumes between the fuel rods in spacers containing partial length fuel rods, in the upper annular flow regime of a fuel bundle.

It is respectfully submitted that all grounds of objection and/or rejection set forth in the Examiner's Action of March 3, 2004 have been overcome. In addition, at the very least, many of the outstanding issues have been eliminated and/or resolved through the amendments proposed in this response, and therefore, should this case go to appeal, the issues have been considerably reduced and simplified. It is also noted that various amendments contained in this response were not earlier presented in light of the Examiner's refusal to enter the preliminary amendment of April 8, 2002, apparently because a similar amendment was denied entry in the originally filed reexamination proceeding. Since the preliminary amendment was in fact presented in this reissue application, applicant maintains that that amendment should have been entered here, even if the Examiner would have had to require resubmission or at least a copy of the

JOHANSSON et al.
Appl. No. 09/659,377
July 6, 2004

amendment in the reexamination file to maintain identity of the files. In any event, entry and consideration of this amendment is therefore fully consistent with 37 CFR 1.116(b).

Applicant also requests that in the event any small matters remain for resolution, the Examiner telephone the undersigned so that the prosecution of this reissue application can be expeditiously concluded.

Respectfully submitted,

NIXON & VANDERHYE P.C.

By: 
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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Reissue Patent Application of

JOHANSSON et al.

Atty. Ref.: 1585-280

Serial No. 09/659,377

Group: 3641

Filed: September 7, 2000

Examiner: Behrend

(Merged with Reexamination Control No.
90/005,098, filed Sept. 3, 1998)

For: OPTIMIZED CRITICAL POWER IN A FUEL BUNDLE WITH PART LENGTH RODS

* * * * *

July 6, 2004

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

LETTER

Attached are two copies of a response to an Official Action dated March 3, 2004 in the above identified Reissue application (now merged with Reexamination Control No. 90/005,098, as required by Section 2285 of the MPEP.

Applicants understand that one copy will be placed in each file.

Respectfully submitted,

NIXON & VANDERHYE P.C.

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

AF / GPB/3600 61
RESPONSE UNDER RULE 116
EXPEDITED HANDLING PROCEDURES

Application of

JOHANSSON et al.

Serial No. 09/659,377

Filed: September 7, 2000

(Merged with Reexamination
Control No. 90/005,098, filed Sept.
3, 1998)Atty Dkt. 1585-280
C# M#

TC/A.U. 3641

Examiner: Behrend

Date: July 6, 2004

Title: OPTIMIZED CRITICAL POWER IN A FUEL BUNDLE WITH PART LENGTH RODS

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Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

RESPONSE/AMENDMENT/LETTER

This is a response/amendment/letter in the above-identified application and includes an attachment which is hereby incorporated by reference and the signature below serves as the signature to the attachment in the absence of any other signature thereon.

 Correspondence Address Indication Form Attached.

Fees are attached as calculated below:

Total effective claims after amendment	12	minus highest number			
previously paid for	32	(at least 20) =	0	x	\$ 18.00
Independent claims after amendment	3	minus highest number			
previously paid for	6	(at least 3) =	0	x	\$ 86.00

If proper multiple dependent claims now added for first time, add \$290.00 (ignore improper)

Petition is hereby made to extend the current due date so as to cover the filing date of this paper and attachment(s) (\$110.00/1 month; \$420.00/2 months; \$950.00/3 months)

Terminal disclaimer enclosed, add \$ 110.00

First/second submission after Final Rejection pursuant to 37 CFR 1.129(a) (\$770.00)
 Please enter the previously unentered , filed
 Submission attached

	Subtotal	\$ 110.00
If "small entity," then enter half (1/2) of subtotal and subtract		-\$ 0.00
<input type="checkbox"/> Applicant claims "small entity" status. <input type="checkbox"/> Statement filed herewith		\$ 0.00
Rule 56 Information Disclosure Statement Filing Fee (\$180.00)		\$ 0.00
Assignment Recording Fee (\$40.00)		\$ 0.00
Other:		0.00

TOTAL FEE ENCLOSED \$ 110.00

The Commissioner is hereby authorized to charge any deficiency, or credit any overpayment, in the fee(s) filed, or asserted to be filed, or which should have been filed herewith (or with any paper hereafter filed in this application by this firm) to our Account No. 14-1140. A duplicate copy of this sheet is attached.

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NIXON & VANDERHYE P.C.
By Atty: Michael J. Keenan, Reg. No. 32,106

Signature: 